UCDS Based Stable Injector Design, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

The Universal Combustion Device Stability (UCDS) Process is the culmination of more than 40 years of research and provides the means to understand the complex dynamics and processes inside any chemical propulsion system, including liquid rockets, solid rockets, hybrid rockets, turbojet combustors and augmentors, and even scramjets. In addition to predicting whether a combustion chamber will oscillate and how large the amplitude of the oscillation will be, UCDS provides insight into WHY a device oscillates. With this type understanding, it is possible to design for stability in any chemical rocket, turbojet or scramjet. GTL proposes to apply the UCDS

TM

Process to create a clean-sheet design for a new stable liquid rocket engine that is suitable to use as an Ascent Engine for Altair. Rather than starting with preconceived notions or heritage constraints, GTL shall exercise the UCDS tools to establish detailed injector design guidelines that will ensure stable operation. This will include definition of functions that define mass injection distribution, vaporization/atomization profile, heat release characteristics, feed system response and many other parameters. By following these requirements in an injector design, the mechanisms that drive oscillations will be minimized, while the damping mechanisms are maximized, thereby maximizing stability margin.

Primary U.S. Work Locations and Key Partners

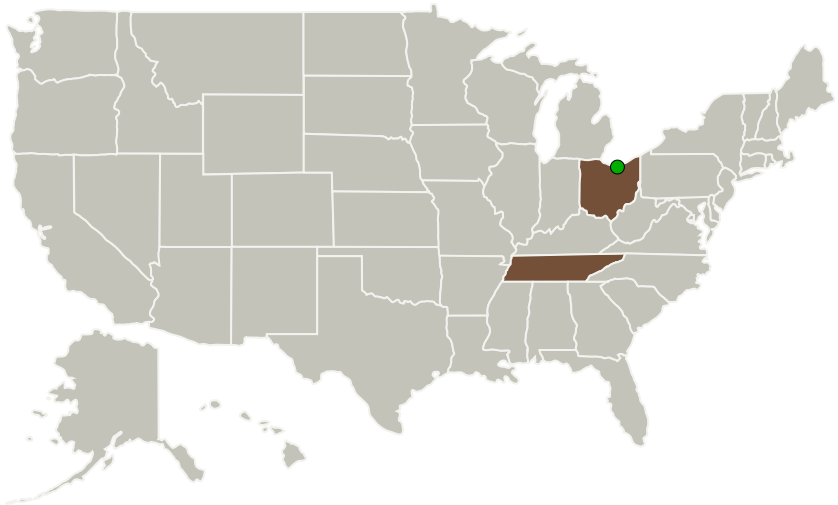

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Table of Contents

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Organizations Performing Work	Role	Type	Location
Gloyer-Taylor Laboratories LLC	Lead Organization	Industry	Tullahoma, Tennessee
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Tennessee

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140782)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Gloyer-Taylor Laboratories LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul Gloyer

Co-Investigator:

Paul Gloyer

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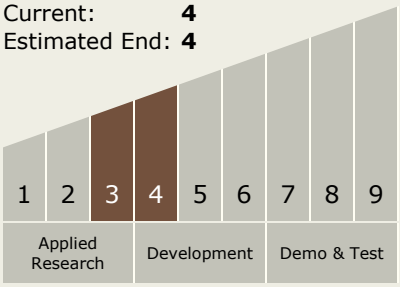
Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System